



THE TRAITS, SKILLS, CAPACITIES, AND CHARACTERISTICS OF CREATIVITY

Margarita Flores Miranda

margarita.flores@gmail.com / marflomi@doctor.upv.es

Bernabé Hernandis Ortuño

bhernand@upv.es

Iñaki Esnal Angulo

iesnalangulo@gmail.com

ETSID Escuela Técnica Superior de Ingeniería del Diseño, Universitat Politècnica de València

RESUMEN

En 1958 Guilford declaró que la creatividad podía ser entendida y desarrollada. Previamente en 1950, durante su discurso presidencial ante la Asociación Americana de Psicología, Guilford argumentó que la creatividad se refiere a las habilidades creativas que son más características en cada persona. El trabajo aquí presentado parte de la investigación de la literatura primaria en este campo, con el objetivo de identificar los términos que los diversos autores relevantes han utilizado para definir las características de la creatividad. Como resultado del estudio metodológico de los términos recopilados, se obtuvo una lista de atributos que sintetiza las contribuciones realizadas desde la aparición del término con Guilford en 1950 hasta el presente. El propósito fundamental de este artículo es que la suma de los atributos alcanzados, representen la condición multidimensional y multifacética de la creatividad, y por lo tanto sean de apoyo en el diseño de técnicas o herramientas educativas, conducentes al desarrollo del potencial creativo en las personas.

Palabras clave: creatividad, atributos, habilidades, desarrollo, Guilford.

ABSTRACT

In 1958 Guilford stated that creativity could be understood and developed. Previously in 1950, during his presidential address to the American Psychological Association, he argued that creativity regards to the creative abilities that are most characteristic in each person. This work departs from the research of primary literature in the field, with the aim of knowing the terms that the various relevant authors have used to define the main characteristics of creativity. As a result of the methodological study of the collected terms, we assemble a list of attributes, which synthesizes the contributions made since the appearance of the term with Guilford in 1950 to the present. The main purpose of this article is that the sum of the attributes presented, represent the multidimensional and multifaceted condition of creativity, and therefore be supportive in the design of educational techniques or tools, conducive to the enhancement of creativity in people.



Keywords: creativity, attributes, abilities, enhancement, Guilford



1. INTRODUCTION

This work offers a list of attributes of creativity that contribute to a more precise understanding of this volatile but fascinating phenomenon. The current field of knowledge offers numerous lists of creative abilities that are the product of research made in the context of the diagnosis of creativity. Its antecedents are in the statistical analyses carried out by psychologist J. Paul Guilford (1897-1987). Among the lists of creative abilities proposed by the various authors, it highlights the absence of a study of its associations, which raises the question about its possible integration into a list of attributes. The present work configures such a list throughout a methodology that collects, analyzes and synthesizes the contributions made to date — departing from the event that marked the beginning of the psychological analysis of creativity: Guilford's address when assuming the presidency of the American Psychological Association (APA) in 1950.

2. MAN AND CREATIVITY

Unlike other animals humans can change their rules of conduct, both learned or inherited. Ibáñez (1984) went so far as to suggest "Man is the only animal that invents. . . . Man plays in the letter of the creation of his being" (p. 1). Creativity has paradoxical existed throughout human history, on the one hand evidencing its abatement because of its disuse, and on the other hand, seeking to characterize itself with the dexterities that each person achieves throughout life. The human being as a unique and unrepeatable entity possesses the ability to create. It is important to remember that it is not enough to live in a world that offers its catalogs of aesthetics and myths, before creating each individual must first find a personal position to share a world then.

As for the satisfaction of human needs, the excess of comfort that characterizes our time has reached absurd levels of efficiency, in which the only thing we have to do is to press a button. What we have ignored is that this button both solves our needs and sets at risk our creative ability. Unaccustomed to take decisions, every time we face an unknown problem we feel that the situation goes beyond the scope of our understanding and our capabilities. This experience suggests we have forgotten that actually, we enjoy making decisions and that by doing so, not only thought and creative production gets activated, but also, we obtain the satisfaction that provides the resolution of problems. Guilford (1958) confirmed this view by stating:

We have developed a social and economic machine of enormous complexity and proportions. The use of that machine has not been an unmixed blessing. It makes possible a fullness of living never before known by the average person. At the same time, it can be crippling to those who learn to depend too much upon it (p. 4).

Fortunately, regardless of the automation of life, there are still many unresolved issues, most of which must be addressed by the use of creativity.

2.1 THE SEARCH FOR BALANCE

When facing the desire to become the best of what one is capable of, every person holds the possibility to recognize their abilities, enhance them, and expand their range. Also, creativity requires the use of diverse skills that sometimes are opposite, hence the importance of training the before-mentioned abilities from a balanced fashion. Frank Barron's famous quote provides a good sense of this "The creative person is both more primitive and more cultivated, more destructive and more constructive, a lot madder and a lot saner, than the average person".

Barron (1995) discovered that innocence operates throughout life and that, fortunately, there are moments when an adult can experience the surprise of seeing things as if it were the first time. It may be a engaged innocence, but ultimately, it is an innocence that survived the shock of growing up. On innocence, Runco



(1996) clarifies that creativity is not entirely childish, but that it requires the combination of the skills rising at childhood with the ones achieved through maturity (p. 3).

As well as in the development of abilities, a person must attempt for balance in the experience. If we pay full attention to the details contained in each new experience, we would not have time for incubation and enlightenment. If, on the other hand, we only concentrate on past experience, our actions will be stiff and automatic. In short, experience provides useful knowledge, but the individual must seek how to take advantage of it, without blindly holding on to it (Riccio, Rabinowitz, & Axelrod, 1994).

2.2 KNOW YOURSELF

Albert (1990) stated that:

Creativity begins with and is expressed through the decisions one makes, not through the particular media used or the products generated. . . . An individual's knowledge of self and particular aspects of his or her world is the ultimate medium of creative behavior (p. 19).

When it comes to a substantial creation, creativity takes a broader, even infinite, meaning. Definitely, for every person the limit is different, hence the importance of the Greek phrase: *gnóthi seautón*, in Latin *nosce te ipsum*, know yourself. A simple invitation to reflect and face the valuable need to know ourselves. In fact, "If we are not to believe either in muses or gods that inspire; that is, if we do not explain creativity from the outside, we have to explain it from the inside" (Rodríguez, 1985, p. 49).

2.3 DESIGN YOURSELF

The creative person exists, both motivated to transform the world in original interpretations, as occupied manifesting them in reality, always discerning when such changes are appropriate to the context and when they are not. Feldman, Csikszentmihalyi, & Gardener (1994) found that for creativity to occur, people have to imagine the changes that could happen in reality and feel the courage to situate themselves in the construction of their culture. The desire for transcendence stimulates such clarity of action; that longing is born from experience and carries the necessary will power to face the obstacles that might appear along the way. In the area of transcendence, Barron (1995) highlighted the importance of intentions by pointing out the possibility to create ourselves and to evolve through our design and the reflection on the changes we attain. As for the process of designing oneself, Barron alluded to free will when he said:

The essence of our human freedom is this, that matter has acquired the capacity to work radical modifications in it. Thus, among its available responses is the ability to act in such a manner as to increase its own flexibility, or deliberately to maximize its own response variability (p.84).

We can infer that creativity, in addition to the mentioned advantages, it is an integrating dimension of human being.

2.4 THE DEVELOPMENT OF CREATIVE SKILLS

Guilford (1958) affirmed that creativity, like any other behavior of human beings, belongs to natural phenomena, and therefore, only after studying it, we could understand it. Clarifying to skeptics that without understanding phenomena, we cannot work with them, but only, limit ourselves to get excited when they happen and to be afflicted when they do not occur. Based on Guilford's work, the efforts aimed to the diagnosis of creativity, pursue the objective of supporting each person in its most creative and profoundly personal line, in which they will feel more fulfilled because they will perform the most significant contributions (Ibáñez, 1995, p.77).



Ortega Y Gasset (1964), considers that there are two types of creatures "those that demand a lot and accumulate on themselves difficulties and duties, and those that, do not demand anything in particular . . . but for them to live is to be what they are without an effort of perfection on themselves" (p. 54). To be creative does not mean having the abilities, in fact, to be creative implies the development of creative skills through its exercise.

In 1950, during his inaugural conference to assume APA's presidency, Guilford distinguished "Creativity refers to the abilities that are most characteristic of creative people. Creative abilities determine whether the individual has the power to exhibit creative behavior to a noteworthy degree" (Guilford, 1968, p. 77). With full commitment, Guilford freed the way to the objective compilation of primary creativity skills, founding his research on experimental and quantitative methods, specifically factorial analysis. In 1948 he received financial support from the Navy and the American Air Force, to identify intellectual abilities and among them, skills in the area of creative thinking (Guilford, 1958). Guilford began this duty, asking which would be the different intellectual tasks performed by humans. His interest was in knowing, how well each person could perform the required ability, and when he identified that a group of individuals tended to solve a set of similar tasks successfully; he concluded that underlying their execution existed a unique type of ability, that he would call a factor.

In Guilford (1968) proposed eight main characteristics of creativity validated by factorial studies: (1) sensitivity to problems, (2) fluency, (3) flexibility, (4) originality or novelty, (5) analysis, (6) synthesis, (7) redefinition, and (8) elaboration or complexity (Guilford, 1968). At the present time, the discovery of creative skills remains effective, suggesting that creativity is not a subjective aspect, but an objective one that is composed of differentiated skills. Even when creative people are so diverse among themselves, some attributes distinguish them, a kind of common denominator, object of study to this research.

3. METODOLOGY

The methodology carried out in this qualitative research attends the objective to build a list of the attributes of creativity. Its process divides into two aspects, the gathering of the skills of creativity and its synthesis through the comparison of similarities and differences.

To collect the skills of creativity from literature, reference databases were used as information channels. According to Cooper, Hedges, and Valentine (2019) these indexing services represent the most fruitful sources of information for current research. Among options, Scopus database was selected since it now represents the largest database of scientific titles and abstracts, peer-reviewed. Edited by Elsevier it contains more than 71 million worldwide records in the fields of science, engineering, medicine, arts, and humanities.

To define the sample population a search was carried out using the following parameters, available on Scopus search-form: search *Creativity*, in *Article title*, subject area *Psychology*, date range *All years to Present*, and document type *Article*. Once determined, the sample was studied considering the following aspects: year of publication, authors, journals, keywords and countries of origin.

From the sample of articles, the skills of creativity determined by the various relevant authors were extracted and organized in a table that relates the source (author and year of publication) with its contribution.

For the analysis of the obtained skills, their frequencies were collected and with the use of three thesaurus-dictionaries: The Free Dictionary, Lexico, and Merriam Webster; the obtained frequencies were semantically categorized into a list of differentiated attributes of creativity. To contextualize the list in the field of creativity, each attribute was defined considering the descriptions provided by the collected authors. As the last step, the attributes were validated through contrast with the index of the Encyclopedia of Creativity, edited by Runco & Pritzker en 1999, selected for its more than 525 citations received.



4. RESULTS AND DISCUSSION

A sample population was defined for the extraction of the creative skills raised by the different authors relevant to the field. The search was conducted in January 2018, via Scopus document search-form, the equation generated by Scopus showed a population of 3,304 articles published by 160 authors, that contain the word creativity in its title, including all the years registered until 2018, in journals linked to the field of physiology.

Scopus generated equation:

TITLE (creativity) AND DOCTYPE (ar) AND PUBYEAR < 2018 AND (LIMIT-TO (SUBJAREA , "PSYC")) AND (LIMIT TO (LANGUAGE , "English") OR LIMIT-TO (LANGUAGE , "Spanish"))

4.1 SAMPLE DEFINITION

Sample definition began with the analysis of the population, based on the number of articles produced by decades (see table 1).

Table 1. Articles published by decades, which include in their title the word creativity

Decade	# Articles	Percentage
2011-2018	1143	35
2001-2010	587	18
1991-2000	549	17
1981-1990	330	10
1971-1980	387	12
1961-1970	282	9
1949 -1960	26	1
Total	3,304	100

Note. Information obtained from the database, Scopus.

The constant increase in the amount of produced publications shows the scientific community interest on the subject of creativity. Considering that the decade whit the largest number of published articles is the current one, 2011-2018 is established as the time range that will characterize the sample. As a second filter, only articles published in journals that incorporate the word creativity in their name were selected, obtaining a sample of 381 articles.

The number of articles published among 2011-2018 per year, varies from 37 to 59 articles, being 2014 the year in which the largest number of publications was registered. The most productive authors of the sample are James C. Kaufman (26 articles), Mark A. Runco (13 articles), and Roni Reiter-Palmon (10 articles). The journals that stand out with the highest number of published articles are Creativity Research Journal (188 articles), Psychology of Aesthetics Creativity and The Arts (85 articles), and Journal of Creative Behaviour (71 articles). The most used keywords are Creativity (135), Divergent thinking (12), Innovation (10), Counselling (8), Personality (8), Intelligence (7) and Openness to experience (7); this set of words indicates the close relationship between creativity and innovation, as well as the importance of the role of divergent thinking, personality, intelligence and openness to experience, as skills to be considered in the enhancement of creativity. Regardless of the dominance in the number the publications by the United States (191 articles), it is surprising to discover the huge participation of East Asia (69 articles) that surpasses the rest of the countries.

4.2 AUTHORS AND SKILLS



From the review of the 381 references, 96 authors were identified to contribute a total of 509 creative skills (see table 2).

Table 2. Creativity skills established by the authors found in the literature

Authors	#	Creative skills
*Acha (2002)	3	desire, drive, willingness to enunciate innovations
Amabile (1983)	3	creativity-relevant processes, domain-relevant skills, task motivation,
Amabile (1996)	4	preparation, response generation, response validation and communication, task identification
Arieti (1976)	4	amorphous, conceptual cognition, imagery, primitive cognition
B. Hayes-Roth and K. Hayes-Roth (1979)	1	redefinition of plans and approach
Barron (1993)	1	controlled weirdness
Barron and Harrington (1981)	15	ability to resolve antinomies, accommodate opposite traits in one's self-concept, analogical and metaphorical abilities, associational abilities, attraction to complexity, autonomy, broad interest, firm self of self as creative, high energy, high valuation of aesthetic qualities, imagery abilities, independence of judgment, intuition, problem finding abilities, self-confidence
Berg (1995)	1	playfulness
Brown (1988)	1	perseverance
Campbell (1962)	1	blind variation and selective retention
Cohen and Ambrose (1999)	3	adaptation
Conti and Amabile (1999)	2	drive, motivation
Costa Jr and McCrae (1985)	6	actions, aesthetics, fantasy, feelings, ideas, values
Costa Jr, McCrae, and Kay (1995)	7	achievement, cognitive structure, endurance, judging, norm-favouring, orderliness, self control
Crutchfield (1962)	3	nonconformity, rebelliousness, unconventionality
Csikszentmihalyi (1996)	1	perseverance
*Csikszentmihalyi (1998)	2	curiosity, flexibility
Cupchik (1999)	1	perception
Dacey, Lennon, and Fiore (1998)	1	self-control
Davidson and Sternberg (1984)	3	selective combination, selective comparison, selective encoding
Davis (1997)	17	adventurousness, anticipate consequences, artisticness, avoid mental and perceptual sets, curiosity, humor, Independence, make good decisions, open-minded, perceptiveness, reflectiveness, risk-taking, see structure in chaos, spontaneity, think critically, tolerance for ambiguity, understand complex issues
Dollinger, Urban, and James (2004)	1	openness to experience
Dudek (1999)	1	aesthetics
Feist (1999)	2	autonomy, independence
Feist and Gorman (1998)	3	conceptual combination, information encoding, problem construction
Feldhusen (1986)	1	self-esteem
Feldhusen, Treffinger, and Bahlke (1970)	4	elaboration, flexibility, fluency, originality,
Finke, Ward, and Smith (1992)	8	analogical transfer, elaboration, examination, idea association, knowledge retrieval, synthesis, testing of the pre-inventive structures, transformation
Golann (1963)	1	tolerance of ambiguity
Goleman, Kaufman, and Ray (1992)	1	frustration
Guilford (1950)	1	sensitivity to problems



Authors	#	Creative skills
Guilford (1967)	1	divergent thinking
Guilford (1968)	8	analysing ability, elaboration (complexity), evaluation, flexibility, fluency, originality (novel ideas), redefinition, synthesizing ability
Heinzen (1999)	1	proactivity
Henle (1962)	5	detached devotion, immersion, receptivity, see the right questions, use errors
Helson (1999a)	1	openness
Helson (1999b)		personality
Hennessey and Amabile (1988)	1	self-esteem
Hertz (1999)	1	invention
Hutchinson (1949)	1	frustration
*Ibáñez (1995)	22	abstraction, analysis, communication, connectivity, creative style, elaboration, expressive wealth, fantasy, figurative expansion, flexibility, fluency, graphic ability, image morphology, imaginative reach, organization, originality, product improvement, redefine or unusual uses, remote associations, resistance to closure, sensitivity to problems, synthesis
Jay and Perkins (1997)	3	problem finding, problem formulation, problem redefinition
Kaplan and Davidson (1988)	1	incubation
Kettner, Guilford, and Christensen (1959)	6	analogical reasoning, conceptual correlates or naming observed relations, correlates or supplying something to complete a pattern, patterns or the capacity to identify relational rules and systems, perceptual relations or seeing perceptual relations, structural relations on seeing similarities
Khandwalla (1993)	1	divergent thinking
Kharkhurin (2014)	4	aesthetics, authenticity, novelty, utility
Kuhn (1970)	1	identifying key facts
*Lowenfeld (1958)	16	abstraction, analysis, communication, elaboration, fluency, hypothesis formation, mental flexibility, organization, originality, product improvement, productivity, questions, redefine (unusual uses), remote associations, sensitivity to problems, synthesis
*Lowenfeld and Brittain (1961)	8	abstraction, flexibility, fluency, organizational coherence, originality, redefinition, sensitivity, synthesis
Ludwig (1995)	1	oppositional thinking
*Maslow (1994)	9	choose the growth option and not the fear option, experience without shyness, honesty, listen to the voices of the impulse, mission, self-realization, summit experience, take responsibility, update of own potential
*Matuseek (1977)	4	causal links, perception of nuances, problem sensitivity, solution process
McCrae (1987)	1	bravery
McCrae and Costa Jr (1999)	5	neuroticism, extraversion, openness to experience, agreeableness, conscientiousness
Mednick (1962)	1	remote associations
Merrifield, Guilford, Christensen, and Frick (1962)	4	conceptual foresight, penetration, problem sensitivity, redefinition
*Miller (2009)	6	analog thinking, brainstorming, flow of ideas, idea manipulation, imagination, incubation of ideas
Mobley, Doares, and Mumford (1992)	2	conceptual combination, reorganization
Mumford, Baughman, Supinski, and Maher (1996)	1	perception
Mumford, Costanza, Threlfall,	1	adaptive flexibility



Authors	#	Creative skills
Baughman, and Reiter-Palmon (1993)		
Mumford, Mobley, Uhlman, Doares, and Reiter-Palmon (1991)	3	evaluate ideas, monitor the success of their efforts, plan implementation activities
Mumford, Supinski, Threlfall, and Baughman (1996)	1	acquiring information bearing on the problem
O'Quin and Derks (1999)	1	humor
Ochse (1990)	1	incubation
Okuda, Runco, and Berger (1991)	1	problem formulation
Olton (1979)	1	incubation
Piaget (1973)	1	abstraction
Policastro (1999)	1	intuition
*Rodriguez Estrada (1985)	14	ambition, autocracy, decision making, devotion, fineness of perception, flexibility, imagination, Independence, intuition, self-confidence, strong intelligence, tenacity, values, versatility
*Rodriguez Estrada (2006)	11	ability to toy with elements and concepts, extensional orientation, feeling that the creation satisfies and expresses oneself, internal locus of evaluation, lack of rigidity, self-actualization, tolerance of ambiguity
Rogers (1954)	7	lack of rigidity, tolerance of ambiguity, extensional orientation, internal locus of evaluation, feeling that the creation satisfies and expresses oneself, ability to toy with elements and concepts, self-actualization
Rotenberg (1999)	1	articulation
Runco (1996)	3	discretion, ego strength, intentionality
Runco (1997)	20	cognitive process, developmental process, divergent thinking, education, emotion and affect, enhancement, free will, giftedness, humor, imagery, imagination, incubation, intelligence, intuition, mental health , metacognition, motivation, personality, potential, problem solving
Runco (1999a)	1	critical thinking
Runco (1999b)	1	divergent thinking
Runco (1999c)	1	self-actualization
Runco (2014)	12	autonomy, curiosity, flexibility, intrinsic motivation, openness to experience, playfulness, preference for complexity, risk taking or risk tolerance, self-efficacy, sensitivity, tolerance of ambiguity, wide interests
Runco and Chand (1995)	7	declarative knowledge, evaluation, extrinsic motivation, ideation, intrinsic motivation, problem finding, procedural knowledge
Runco and Dow (1999)	1	problem finding
Russ (1993)	34	access to affect-laden thought, adaptive regression, affective fantasy in play, affective pleasure in challenge, affective pleasure in problem solving, cognitive, integration of affect, comfort with intense affect, control affect, critical thinking skills, curiosity, divergent thinking, evaluative ability, incidental learning, independence of judgment, insight ability, intrinsic motivation, mood-induction, openness to affect states, openness to experience, passionate involvement in task, preference for challenge, preference for complexity, primary process thinking, risk taking, self-confidence, sensitivity to problems, tendency to practice with alternative solutions, tolerance of ambiguity, tolerance of anxiety, tolerance of failure, transformation abilities, use analogies, wide breath of knowledge, wide range of interest
Russ (1999)	2	emotion, affect
*Salas (2002)	7	anti-conventionalism, independence of judgment, intrinsic motivation, originality, persistence, sensitivity to problems, work discipline
Sapp (1992)	1	frustration
Scott (1999)	1	knowledge



Authors	#	Creative skills
Simonton (1998)	2	anomalous observations, evaluation of ideas
Singer (1999)	1	imagination
Smith and Dodds (1999)	1	incubation
Stein (1953)	9	communication, direction, flexibility, hypothesis formation, hypothesis testing, insight, sensitivity, time perspective oriented to the future, tolerate ambiguity
Sternberg (2005)	7	advance forward incrementation, forward incrementation, reconstruction, redefinition, redirection, reinitiation, synthesis
Sternberg (2006)	2	confluence, decision making
Sternberg and Davidson (1999)	1	insight
Sternberg and Lubart (1991)	13	analytic skill, big picture view, extrinsic motivation, individuality, intrinsic motivation, knowledge, novel ways, openness to new experiences, perseverance, practical skill, synthetic skill, willingness to take risk, willingness to tolerate ambiguity
Sternberg & Lubart (1992)	3	selective-combination insight, selective-comparison insight, selective-encoding insight
*Sternberg and Lubart (1993)	13	ability to face risks, ambiguity tolerance, define and redefine problems, divergent thinking, environmental context, insight, intellectual styles, intelligence, knowledge, motivation, self-esteem, willingness to continue growing and creating, willingness to overcome obstacles and persevere
Stokes (1999)	1	novelty
Taylor (1964)	16	cognition, convergent production, dedication to work, desire to bring order out of disorder, desire to discovery, divergent production, drive, evaluation, feminity of interest, Independence, memory, professional self-confidence, resourcefulness, self-sufficiency, striving for general principles, tolerance of ambiguity
Thurston and Runco (1999)	1	flexibility
Torrance (1962)	8	altruistic, energetic, Independence, industrious, persistent, self-assertive, sensitivity, versatile
Torrance and Shaughnessy (1998)	18	being aware of emotions and using them, being flexible, combining and synthesizing, elaboration, enjoying and using fantasy, extending boundaries by cutting through them or going beyond them, giving ideas movement and sound, glimpsing infinity, highlighting the essence, keeping open, letting humor flow, looking at problems and solutions in many ways, problem finding, producing many alternatives, producing original ideas, putting ideas into context, visualizing richly and colorfully, visualizing things internally, below the surface
Tuska (1957)	2	observe, question
Urban (1995)	38	analyzing and synthesizing thinking, broad perception and information processing, communication, concentration, critical end evaluative thinking, curiosity, defocusing, devotion and duty, drive for knowledge, elaboration, expertise, external recognition, flexibility, fluency, humor, increasing acquisition and mastery of specific knowledge and skills for specific areas of creating thinking and acting, memory network, metacognition, need of control and instrumental profit, need of novelty, nonconformity and autonomy, openness to experience, originality, playfulness, postponing quick solutions, problem sensitivity, readiness for risk-taking, reasoning and logical thinking, regression and relaxation, remote associations, restructuring and redefinition, selectivity, self-actualization, steadfastness and persistence, task commitment, thinking, tolerance of ambiguity, topic/ object / product focusing
Veron (1970)	1	tolerance of ambiguity
Wallach and Kogan (1965)	1	physiognomic sensitivity
Ward, Smith, and Vaid (1997)	1	analogy and metaphor
Weisberg (1993)	1	analogy and metaphor



Authors	#	Creative skills
West and Rickards (1999)	1	innovation
Wilson, Guilford, and Christensen (1954)	6	adaptive flexibility, conceptual foresight, penetration, problem sensitivity, redefinition judgment, spontaneous flexibility
Wink (1999)	1	self processes
Witt and Beorkrem (1989)	7	autonomy, encouragement specifically for originality, freedom, freedom from criticism, good role models and resources (including time), innovation, norms in which innovation is prized and failure not fatal
Woodman & Schoenfeldt (1990)	3	cognitive abilities and styles, organismic variables, personality traits

Note: Words marked with * were translated from Spanish to English.

After extracting the skills enunciated by the authors of the references listed, it is possible to analyze them through a grouping process.

4.2 STUDY OF FREQUENCIES

By collecting the existent frequencies among the 509 skills identified, a list of 344 skills was generated (see table 3).

Table 3. Frequencies among the creative skills identified in the literature

<i>f</i>	Skill	Author
2	Analogy and metaphor	Ward et al. (1997), Weisberg (1993)
	Conceptual combination	Fiest and Gorman (1998), Mobley et al. (1992)
	Conceptual foresight	Merrifield et al. (1962), Wilson et al. (1954)
	Decision making	Sternberg (2006), Rodríguez Estrada (1985, 2006)
	Freedom	Rodríguez Estrada (2006), Witt and Beorkrem (1989)
	Hypothesis formation	Lowenfeld (1958), Stein (1953)
	Metacognition	Runco (1997), Urban (1995)
	Penetration	Merrifield et al. (1962), Wilson et al. (1954)
	Problem formulation	Okuda, Runco and Berger (1991), Jay and Perkins (1997)
	Questions	Tuska (1957), Lowenfeld (1958),
	Self-control	Costa et al. (1995), Dacey et al. (1998)
	Transformation abilities	Finke et al. (1992), Russ (1993)
	Values	Costa Jr and McCrae (1985), Rodríguez Estrada (1985)
Versatility	Rodríguez Estrada (1985), Torrance (1962)	
3	Drive	Acha (2002), Conti and Amabile (1999), Taylor (1964)
	Frustration	Goleman et al. (1992), Hutchinson (1949), Sapp (1992)
	Imagery	Arieti (1976), Barron and Harrington (1981), Runco (1997)
	Intelligence	Rodríguez Estrada (1985), Runco (1997), Sternberg and Lubart (1993)
	Innovation	Acha (2002), West and Rickards (1999), Witt and Beorkrem (1989)
	Organization	Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961)
	Perseverance	Brown (1988), Csikszentmihalyi (1996), Sternberg and Lubart (1991)
	Persistence	Salas (2002), Torrance (1962), Urban (1995)
	Personality	Helson (1999b), Runco (1997), Woodman and Schoenfeldt (1990)



<i>f</i>	Skill	Author
	Playfulness	Berg (1995), Runco (2014), Urban (1995)
	Product improvement	Ibáñez (1995), Lowenfeld (1958), Urban (1995)
	Self-actualization	Rogers (1954), Runco (1999a), Urban (1995)
	Wide range of interest	Barron and Harrington (1981), Runco (2014), Russ (1993)
4	Abstraction	Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961), Piaget (1973)
	Aesthetics	Barron and Harrington (1981), Costa Jr and McCrae (1985), Dudek (1999), Kharkhurin (2014)
	Attraction to complexity	Barron and Harrington (1981), Davis (1997), Runco (2014), Russ (1993)
	Fantasy	Costa Jr and McCrae (1985), Ibáñez (1995), Russ (1993), Torrance and Shaughnessy (1998)
	Insight	Russ (1993), Stein (1953), Sternberg and Davidson (1999), Sternberg and Lubart (1992, 1993)
	Intuition	Barron and Harrington (1981), Policastro (1999), Rodríguez Estrada (1985), Runco (1997)
	Novelty	Kharkhurin (2014), Sternberg and Lubart (1991), Stokes (1999), Urban (1995)
	Remote associations	Ibáñez (1995), Lowenfeld (1958), Mednick (1962), Urban (1995)
	Self-confidence	Barron and Harrington (1981), Rodríguez Estrada (1985), Russ (1993), Taylor (1964)
	Self-esteem	Feldhusen (1986), Hennessey and Amabile (1988), Rodríguez Estrada (2006), Sternberg and Lubart (1993)
5	Autonomy	Barron and Harrington (1981), Feist (1999), Runco (2014), Urban (1995), Witt and Beorkrem (1989)
	Analysis	Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Sternberg and Lubart (1991), Urban (1995)
	Critical thinking	Davis (1997), Rodríguez Estrada (2006), Runco (1999), Russ (1993), Urban (1995)
	Communication	Amanile (1996), Ibáñez (1995), Lowenfeld (1958), Stein (1953), Urban (1995)
	Humor	Davis (2003), O'Quin and Derks (1999), Runco (1997), Torrance and Shaughnessy (1998), Urban (1995)
	Imagination	Ibáñez (1995), Miller (2009), Rodríguez Estrada (1985), Runco (1997), Singer (1999)
	Knowledge	Finke et al. (1992), Runco and Chand ((1995), Russ (1993), Scott (1999), Sternberg and Lubart (1991, 1993)
	Risk-taking	Davis (1997), Runco (2014), Russ (1993), Sternberg and Lubart (1991, 1993), Urban (1995)
	Problem finding	Barron and Harrington (1981), Jay and Perkins (1997), Runco and Chand (1995), Runco and Dow (1999), Torrance and Shaughnessy (1998)
	Sensitivity	Lowenfeld and Brittain (1961), Runco (2014), Stein (1953), Torrance (1962), Wallach and Kogam (1965)
6	Curiosity	Csikszentmihalyi (2006), Davis (2003), Rodríguez Estrada (2006), Runco (2014), Russ (1993), Urban (1991)
	Divergent thinking	Guilford (1967), Khandwalla (1993), Runco (1997, 1999c), Russ (1993), Sternberg and Lubart (1993), Taylor (1964)
	Fluency	Feldhusen et al. (1970), Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961), Urban (1995)
	Incubation	Kaplan and Davidson (1988), Miller (2009), Ochse (1990), Olton (1979), Runco (1997), Smith and Dodds (1999)
	Openness to experience	Dollinger et al. (2004), McCrae and Costa (1999), Runco (2014), Russ (1993), Sternberg and Lubart (1997), Urban (1995)
7	Motivation	Amabile (1983), Conti and Amabile (1999), Runco (1997, 2014), Runco and Chand (1995), Russ (1993), Salas (2002), Sternberg and Lubart (1991, 1993)
	Perception	Cupchik (1999), Davis (1997), Kettner et al. (1959), Matusek (1977), Mumford et al. (1996), Rodríguez Estrada (1985), Urban (1995)
	Elaboration	Feldhusen et al. (1970), Finke et al. (1992), Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Torrance and Shaughnessy (1998), Urban (1995)



<i>f</i>	Skill	Author
	Evaluation	Guilford (1968), Mumford et al. (1991), Ronger (1954), Runco and Chand (1995), Russ (1993), Simonton (1998), Taylor (1964)
8	Independence	Barron and Harrington (1981), Davis (1997), Feist (1999), Rodríguez Estrada (1985), Russ (1993), Salas (2002), Taylor (1964), Torrance (1962)
	Originality	Feldhusen et al. (1970), Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961), Salas (2002), Urban (1995), Witt and Beorkrem (1989)
9	Sensitivity to problems	Guilford (1950), Ibáñez (1995), Lowenfeld (1958), Matuseek (1977), Merrifield et al. (1962), Russ (1993), Salas (2002), Urban (1995), Wilson et al. (1954)
	Synthesis	Finke, et al. (1992), Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961), Sternberg (2005), Sternberg and Lubart (1991), Torrance and Shaughnessy (1998), Urban (1995)
11	Redefinition	B. Hayes-Roth and H. Hayes-Roth (1979), Guilford (1968), Ibáñez (1995), Jay and Perkins (1997), Lowenfeld (1958), Lowenfeld and Brittain (1961), Merrifield et al., (1962), Sternberg (2005), Sternberg and Lubart (1993), Urban (1995), Wilson et al. (1954)
	Ambiguity tolerance	Davis (1997), Golann (1963), Rodríguez Estrada (2006), Rogers (1954), Runco (2014), Russ (1993), Stein (1953), Sternberg and Lubart (1991, 1993), Taylor (1964), Urban (1995), Veron (1970)
14	Flexibility	Csikszentmihalyi (1998), Feldhusen et al. (1970), Guilford (1968), Ibáñez (1995), Lowenfeld (1958), Lowenfeld and Brittain (1961), Mumford et al. (1993), Rodríguez Estrada (1985), Runco (2014), Stein (1953), Thurston and Runco (1999), Torrance and Shaughnessy (1998), Urban (1995), Wilson et al. (1954)

Note. *f* = Number of times each skill was found in the literature.

A primary finding was to identify that the frequencies contain all the characteristics of creativity that Guilford proposed in 1968: (1) sensitivity to problems_ *f9*, (2) fluency_ *f6*, (3) flexibility_ *f14*, (4) originality_ *f8*, (5) analysis_ *f5*, (6) synthesis *f9*, (7) *redefinition_ f11*, and (8) elaboration_ *f7*. It is important to keep in mind that in correspondence with the definition of creativity which refers to a contribution that is valuable and not only original, the word communication reaches a frequency *f5*, confirming that if the person can not communicate the value of its product, this will not be acknowledged by society as being creative.

4.2 SEMANTIC CATEGORIZATIONS

To avoid redundancies between the meanings of the obtained skills, these were semantically classified, using the thesaurus: The Free Dictionary, Lexico, and Merriam-Webster. As a result, 38 categories were obtained; the word with the most representative meaning for each group converts into an attribute (See table 4).

Table 4. Semantic categorization of creative skills identified in the literature

Category name	Skills within the category
Abstraction	abstraction (4), defocusing, highlighting the essence
Adaptation	adaptation, adaptive regression, openness, openness to affect states, openness to experience (6), transformation abilities (2)
Aesthetics	aesthetics (4)
Ambiguity tolerance	ambiguity tolerance (11), regression and relaxation
Analysis	analysis (4), examination, reasoning and logical thinking, selective comparison
Communication	articulation, communication (5)
Contribution	agreeableness, altruistic, big picture view, discretion, external recognition, make good decisions, utility, values (2)



Category name	Skills within the category
Critical thinking	critical thinking (5), confluence, convergent production, evaluation (7), judging, reflectiveness, selectivity, think critically, thinking
Curiosity	attraction to complexity (4), curiosity (6), desire for discovery, feminity of interest, observe, wide range of interest (3)
Divergent thinking	divergent thinking (6)
Elaboration	conscientiousness, depth, elaboration (7), figurative expansion, giving ideas movement and sound, graphic ability, immersion, penetration (2), preparation, visualizing richly and colorfully, visualizing things internally below the surface
Fantasy	fantasy (4)
Flexibility	ability to toy with elements and concepts, expressive wealth, extending boundaries by cutting through them or going beyond them, extensional orientation, flexibility (14), idea manipulation, keeping open, lack of rigidity, looking at problems and solutions in many ways, open-minded, playfulness (3), spontaneity, tendency to practice with alternative solutions
Fluency	brainstorming, flow of ideas, fluency (6), producing many alternatives
Frustration tolerance	frustration (3), tolerance of anxiety, tolerance of failure, use errors
Humor	humor (5)
Imagination	image morphology, imagery (3), imagination (5)
Incubation	incubation (6).
Innovation	innovation (3), product improvement (3)
Insight	creativity-relevant processes, glimpsing infinity, ideas, ideation, insight (4), intuition (4), listen to the voices of the impulse, perception (6), perceptiveness, producing original ideas, summit experience
Intelligence	intelligence (3), intellectual capacity, intellectual styles
Invention	concentration, increasing mastery of specific knowledge and skills, metacognition (2)
Knowledge	blind variation and selective retention, cognition, cognitive abilities and styles, cognitive integration of affect, cognitive process, cognitive structure, conceptual cognition, domain-relevant skills, education, expertise, incidental learning, knowledge (5), memory, memory network
Metacognition	concentration, increasing mastery of specific knowledge and skills, metacognition (2)
Motivation	affect, desire, drive (3), emotion, emotion and affect, feelings, motivation (7)
Originality	anomalous observations, anti-conventionalism, authenticity, avoid mental and perceptual sets, novelty (4), originality (8), oppositional thinking, unconventionality
Personality	individuality, personality (3)
Proactivity	actions, anticipate consequences, direction, energetic, high energy, industrious, need of control and instrumental profit, plan implementation activities, proactivity, productivity, time perspective orientated to the future
Problem finding	access to affect-laden thought, amorphous, being aware of emotions and using them, desire to bring order out of disorder, environmental context, identifying key facts, intentionality, primary process thinking, primitive cognition, problem finding (5), problem sensitivity (9), receptivity, sensitivity (5), task identification
Problem solving	affective pleasure in problem solving, advance forward incrementation, decision making (2), developmental process, forward incrementation, hypothesis testing, norm-favouring, practical skill, problem construction, problem formulation (2), problem solving, putting ideas into context, reconstruction, redefinition (11), redirection, reinitiation, reorganization, response generation, solution process, testing of the pre-inventive structures
Remote associations	ability to resolve antinomies, analog thinking, analogical and metaphorical abilities, analogical reasoning, analogical transfer, analogy and metaphor (2), associational abilities, causal links, conceptual combination (2), conceptual correlates or naming observed relations, connectivity, correlates or supplying something to complete a pattern, idea association, organismic variables, patterns or the capacity to identify relational rules and systems, remote associations (4), see structure in chaos, structural relations on seeing similarities, use analogies
Research	acquiring information bearing on the problem, drive for knowledge, questions (2), see the right



Category name	Skills within the category
Resistance to closure	questions resistance to closure, endurance, perseverance (3), persistence (3), postponing quick solutions, task commitment, tenacity
Risk-taking	adventurousness, affective pleasure in challenge, audacity, bravery, choose the growth option and not the fear option, ego strength, experience without shyness, extraversion, norms in which innovation is prized and failure not fatal, preference for challenge, rebelliousness, risk taking (5)
Self-esteem	accommodate opposite traits in one's self-concept, autocracy, autonomy (5), free will, freedom (2), honesty, independence (8), nonconformity, self-assertive, self-confidence (4), self-esteem (4), take responsibility
Self-realization	achievement, ambition, artisticness, creative style, enhancement, feeling that the creation satisfies and expresses oneself, firm self of self as creative, giftedness, good role models and resources (including time), mental health, monitor the success of their efforts, potential, resourcefulness, self-actualization (3), self-efficacy, self-processes, self-realization, self-sufficiency, update of own potentials, versatile (2), willingness to continue growing and creating
Synthesis	synthesis (9), information encoding, orderliness, organization (3), selective combination, selective encoding
Will power	comfort with intense affect, control affect, controlled weirdness, dedication to work, detached devotion, devotion, duty and mission, mood-induction, passion, passionate involvement in task, self-control (2), striving for general principles, willingness to overcome obstacles and persevere, work discipline

Note. Categories made based on sources: <https://www.freethesaurus.com>, <https://www.merriam-webster.com/thesaurus> y <https://www.lexico.com/en/synonym>

To contextualize the final list in the field of research, each attribute was defined by synthesizing the descriptions made by the included authors (See table 5).

Table 5. List of creative attributes and their definitions

Attribute	Definition
Abstraction	A rational exercise consisting of recognizing the qualities of an object or a fact to consider them in their pure essence.
Adaptation	Ability to adapt to the existing conditions or to transform a given situation into the desired situation.
Aesthetics	Harmonious order of the elements configuring a whole that delights the senses.
Ambiguity tolerance	Overcome the uncertainty and the chaos that arises when it is not clear how to solve a problem.
Analysis	Separate a whole into its constituent parts to examine its particular qualities and understand the whole in greater detail.
Communication	Ability to convincingly convey a message to others.
Contribution	Provide greater value to the environment.
Critical thinking	Reasoning that considers, evaluates and purifies the available options.
Curiosity	A natural interest to question and understand in depth a situation or phenomenon.
Divergent thinking	Reasoning that goes in several directions to produce multiple logical responses out of the same source.
Elaboration	Give form and life to a purpose through meticulous work, moving away from the obvious to address the details that are unpredictable at first instance.
Fantasy	Availability to explore the inner worlds allowing the mind to wander and create non-existent things.



Attribute	Definition
Flexibility	Opening to ideate and explore different categories of answers in the resolution of a problem.
Fluency	Ability to quickly produce many ideas for the solution of a problem.
Frustration to tolerance	Show commitment to one's ideas in the light of rejection or criticism from the context.
Humor	Talent to present reality highlighting a relevant incongruity of things that moves to laughter.
Imagination	Mental ability to produce and associate images from which it is possible to visualize the past or estimate the future.
Incubation	Stage in which the mind automatically works in the solution of a problem, while the person relaxes performing activities that are not related to the issue.
Innovation	Effect of transforming something with the intention of improving it by adding novel aspects.
Insight	Instant of clarity and certainty about the solution to the problem, which arises unexpectedly as a result of dedicated work.
Intelligence	Ability to understand and prosper in context, it implies the effective communication of the generated ideas.
Invention	A proposal that emerges from what exists, to offer something that is not yet present.
Knowledge	Stored information that becomes essential in solving a problem, it consists of data and experiences obtained, systematized and available to memory.
Metacognition	Ability to think about our own mental processes.
Motivation	Primary intention without which there is no action, it nourishes the energy that originates in the person and underlies its behavior.
Originality	Produce unique and surprising ideas that offer new values to the context.
Personality	Ability to recognize oneself as a singular person who owns a unique pattern of traits.
Proactivity	Faculty of the person who take control and decide what to do in anticipation of the events.
Problem finding	Ability to remain open and interested in identifying and specifying incomplete or failed situations.
Problem solving	Act of transforming a given situation into a desirable one, it requires the precise definition of the current state, the expected state, and the set of operations to be fulfilled.
Remote associations	Distinguish similarities between phenomena of different kinds, the more distance there is between the related aspects, the more significant the discovery will be.
Research	Perform intellectual and experimental activities in a systematic way, with the purpose of increasing the existing knowledge on a specific topic.
Resistance to closure	Ability to continue working until attaining the desired result.
Risk-taking	The mental strength that moves to perform an action that could have undesirable consequences.
Self-esteem	To think and act legitimate according to one's convictions, it represents the distinction and recognition of true being.
Self-realization	The satisfactory achievement of personal aspirations, tendency to realize one's potential.
Synthesis	Compose a whole through the articulation of its independent parts to obtain a higher value.
Will power	To decide and order own behavior, when confronting an action that



Attribute	Definition
	involves difficulty and effort.

As a final step to confirm the validity of the list, the obtained attributes were compared with the index of the Encyclopedia of Creativity edited by Runco & Pritzker in 1999 (See table 6).

Table 6. Comparison between the list of attributes and the index of the Encyclopedia of Creativity

Attribute	Title in the index of the Encyclopedia of Creativity	Author
Abstraction	-	-
Adaptation	Adaptation and Creativity	LeoNora M. Cohen and Don Ambrose
Aesthetics	Art and Aesthetics	Stephanie Z. Dudek
Ambiguity tolerance	-	-
Analysis	-	-
Communication*	Advertising	Sandra E. Moriarty and Brett A. Robbs
Contribution	-	-
Critical thinking	Critical thinking	Mark A. Runco
Curiosity	-	-
Divergent thinking	Divergent thinking	Mark A. Runco
Elaboration	-	-
Fantasy*	Dreams and Creativity	Stanley krippner
Flexibility	Flexibility	Becky J. Thurston and Mark A. Runco
Fluency*	Brainstorming	Tudor Rickards
Frustration tolerance	-	-
Humor	Humor	Karen O'Quin and Peter Derks
Imagination	Imagination	Jerome L. Singer
Incubation	Incubation	Steven M. Smith and Rebeca A. Dodds
Innovation	Innovation	Michael A. West and Tudor Rickards
Insight	Insight	Robert J. Sternberg and Janet E. Davidson
Intelligence	Intelligence	Robert J. Sternberg
Invention	Invention	Michael Hertz
Knowledge	Knowledge	Teres Enix Scott
Metacognition	Metacognition	Norbert Jaušovec
Motivation	Motivation/Drive	Regina Conti and Teresa Amabile
Originality*	Novelty	Patricia D. Stokes
Personality	Personality	Ravenna Helson
Proactivity	Proactive Creativity	Thomas E. Heinzen
Problem finding	Problem Finding	Mark A. Runco and Gayle Dow
Problem solving	Problem Solving	Richard E. Mayer
Remote associations	Associative Theory	Daniel Fasko Jr.
Research*	Science	Kevin Dunbar
Resistance to closure	-	-



Attribute	Title in the index of the Encyclopedia of Creativity	Author
Risk-taking	-	-
Self-esteem	Autonomy and independence	Gregory J. Feist
Self-realization*	Self-actualization	Mark A. Runco
Synthesis	-	-
Will power	-	-

Note. Attributes marked with * are considered synonymous with the titles in the Encyclopedia of Creativity.

It is essential to visualize that the first abilities that focused on creative thinking have transcended in time, but also new abilities concerning the creative personality have arisen. During the totality of the period studied, the following attributes were announced by different authors more than 10 times: adaptability (12), ambiguity tolerance (13), critical thinking (18), curiosity (16), elaboration (18), flexibility (28), insight (25), knowledge (20), motivation (19), originality (18), proactivity (11), problem finding (30), problem solving (33), remote associations (24), resistance to closure (12), risk taking (17), self-esteem (31), self-realization (24), synthesis (16), will power (16).

As future lines of research, it will be relevant to validate the obtained list by quantitative analysis, considering the opinion of a representative group of professionals capable of assessing the attributes from their creative practice.

4. CONCLUSION

The list of attributes presented is shared by Guilford's idea of creativity as a human condition composed by multiple aspects. On the polarity between some of the attributes contained in the resulting list, as it is in the case of divergent and synthetic thinking, it is important to comment that coexistence among attributes is possible if we consider the notion of equilibrium described in the theoretical framework of this study. To this, it can be added that the point of balance is different in each one, therefore the enhancement of creativity in a person is linked both to the knowledge of the attributes of creativity, as well as to its identification and its balanced development.

Creativity works to achieve favorable change, an incessant need of humanity. In an increasingly complex and challenging world, a person should be interested in understanding its creativity and in designing the way to reach its potential. At the social level, it is essential that teachers in education and the institutions supporting them learn how to identify and enhance creativity in their students. By the awareness of the attributes of creativity, an opportunity opens up, to improve by the conscious treatment of our attributes; such development would generate an increase of creativity, confident for the individual and consequently for its society.



6. REFERENCES

- Acha, J. (2002). *Introducción a la creatividad artística*. México: Trillas.
- Albert, R. S. (1990). Identity, experiences, and career choice among the exceptionally gifted and eminent. In M. A. Runco, & R. S. Albert (Ed.), *Theories of creativity* (Vol. 115, pp. 13-34). Thousand Oaks, CA: Sage Publications, Inc.
- Amabile, T. M. (1983). The social psychology of creativity: A componential conceptualization. *Journal of Personality and Social Psychology*, 45 (2), 357-376.
- Amabile, T. M. (1996). *Creativity in context*. Boulder, CO: Westview Press.
- Arieti, S. (1976). *Creativity: The magic synthesis*. New York: Basic Books.
- Barron, F. (1993). Controllable oddness as a resource in creativity. *Psychological Inquiry*, 4 (3), 182-184.
- Barron, F. (1995). *No rootless flower: An ecology of creativity*. Cresskill, NJ: Hampton Press.
- Barron, F. (1995). The disposition toward originality. *The Journal of Abnormal and Social Psychology*, 51 (3), 478-485.
- Barron, F., & Harrington, D. M. (1981). Creativity, intelligence, and personality. *Annual review of psychology*, 32 (1), 439-476.
- Berg, D. H. (1995). The power of playful spirit at work. *Journal for Quality and Participation*, 18 (4), 32-39.
- Brown, K. A. (1988). *Inventors at work: Interviews with 16 notable American inventors*. Redmond, WA: Microsoft Press.
- Campbell, D. T. (1962). Blind variation and selective retentions in creative thought as in other knowledge processes. *Psychological Review*, 67 (6), 380-400.
- Cohen, L., & Ambrose, D. (1999). Adaptation and creativity. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of Creativity* (Vol. 1, pp. 9-22). San Diego, CA: Academic Press.
- Conti, R., & Amabile, T. (1999). Motivation / Drive. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of Creativity* (Vol. 2, pp. 251-259). San Diego, CA: Academic Press.
- Cooper, H., Hedges, L. V., & Valentine, J. C. (Eds.). (2019). *The handbook of research synthesis and meta-analysis*. Russell.
- Costa Jr, P. T., & McCrae, R. R. (1985). *The NEO Personality Inventory manual and NEO Five-Factor Inventory (NEO-FFI) manual*. Odesa, Fla: Psychological Assessment Resources, Inc.
- Costa Jr., P. T., McCrae, R. R., & Kay, G. G. (1995). Persons, places, and personality: Career assessment using the Revised NEO Personality Inventory. *Journal of Career Assessment*, 3 (2), 123-139.
- Crutchfield, R. S. (1962). Conformity and creative thinking. In H. E. Gruber, G. Terrell, & M. Wertheimer (Ed.), *Contemporary Approaches to Creative Thinking: A symposium held at the University of Colorado*. New York: Atherton.
- Csikszentmihalyi, M. (1996). *Creativity*. New York: Harper Collins.
- Csikszentmihalyi, M. (1998). *Creatividad: el flujo y la psicología del descubrimiento y la invención*. Barcelona, España: Paidós.
- Cupchik, G. (1999). Perception and Creativity. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of Creativity* (Vol. 2, pp. 355-360). San Diego, CA: Academic Press.



- Dacey, J. S., Lennon, K., & Fiore, L. B. (1998). *Understanding creativity: The interplay of biological, psychological, and social factors*. Jossey-Bass Inc Pub.
- Davidson, J., & Sternberg, R. (1984). The role of insight in intellectual giftedness. *Gifted child quarterly* , 28 (2), 58-64.
- Davis, G. A. (1997). *Identifying creative students and measuring creativity. Handbook of gifted education* (Vol. 2).
- Dollinger, S. J., Urban, K. K., & James, T. A. (2004). Creativity and openness: Further validation of two creative product measures. *Creativity Research Journal* , 16 (1), 35-48.
- Dudek, S. (1999). Art and aesthetics. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 99-113). San Diego, CA: Academic Press.
- Feist, G. J. (1999). Autonomy and independence. In R. Mark, & R. S. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 157-163). San Diego, C.A.: Academic Press.
- Feldhusen, J. F. (1986). A conception of giftedness. In R. J. Sternberg, & J. E. Davidson (Eds.), *Conceptions of giftedness* (pp. 112-127). New York: Cambridge University Press.
- Feldhusen, J., Treffinger, D., & Bahlke, S. (1970). Developing creative thinking: The Purdue creativity program. *The Journal of Creative Behavior* , 4 (2), 85-90.
- Feldman, D. H. (1994). *Changing the world: A framework for the study of creativity*. Westport, CT.
- Fiest, G. J., & Gorman, M. E. (1998). The psychology of science: Review and integration of a nascent discipline. *Review of General Psychology* , 2 (1), 3-47.
- Finke, R. A., Ward, T. B., & Smith, S. M. (1992). *Creative cognition: Theory, research, and applications*. Cambridge, MA, US: MIT Press.
- Golann, S. E. (1963). Psychological study of creativity. *Psychological Bulletin* , 60 (6), 548-565.
- Goleman, D., Kaufman, P., & Ray, M. L. (1992). *The creative spirit*. New York: Dutton.
- Guilford, J. P. (1950). Creativity. *American Psychologist* , 444-454.
- Guilford, J. P. (1958). Can creativity be developed? *National Art Education Association* , 11 (6), 3-7+14-18.
- Guilford, J. P. (1967). *The nature of human intelligence*. New York, NY, US: McGraw-Hill Inc.
- Guilford, J. P. (1968). *Intelligence, creativity, and their educational implications*. San Diego, California: Robert R. Knapp.
- Hayes-Roth, B., & Hayes-Roth, F. (1979). A cognitive model of planning. *Cognitive Science* , 3 (4), 275-310.
- Heinzen, T. (1999). Proactive creativity. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 429-431). San Diego, CA: Academic Press.
- Henle, M. (1962). The birth and death of ideas. In H. E. Gruber, G. Terrell, & M. Wertheimer (Eds.), *The Atherton Press behavioral science series. Contemporary approaches to creative thinking: A symposium held at the University of Colorado* (pp. 31-62). New York, NY: Atherton Press.
- Hennessey, B. A., & Amabile, T. M. (1988). The role of the environment in creativity. In R. J. Sternberg (Ed.), *The nature of creativity* (pp. 11-38). New York: Cambridge University Press.
- Hertz, M. (1999). Invention. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of Creativity* (Vol. 2, pp. 95-102). San Diego, CA: Academic Press.
- Hutchinson, E. D. (1949). *How to think creatively*. Oxford, England: Abingdon.



- Ibáñez, R. M. (1984). *La Creatividad* (2nd ed.). Barcelona: Ceac.
- Ibáñez, R. M. (1995). *La creatividad: diagnóstico, evaluación e investigación*. Madrid, España: UNED.
- Jay, E. S., & Perkins, D. N. (1997). Problem finding: The search for mechanism. In M. A. Runco, *The creativity research handbook* (Vol. 1, pp. 257-293). Cresskill, NJ: Hampton.
- Kaplan, C. A., & Davidson, J. (1988). Incubation effects in problem solving (No. AIP-57). *CARNEGIE-MELLON UNIV PITTSBURGH PA ARTIFICIAL INTELLIGENCE AND PSYCHOLOGY PROJECT*.
- Kettner, N. W., Guilford, J. P., & Christensen, P. (1959). A factor analysis study across the domains of reasoning, creativity, and evaluation. *Psychological Monographs: General and Applied*, 73 (9), 1-31.
- Khandwalla, P. N. (1993). An exploratory investigation of divergent thinking through protocol analysis. *Creativity Research Journal*, 6 (3), 241-259.
- Kharkhurin, A. V. (2014). Creativity.4in1: Four-Criterion Construct of Creativity. *Creative Research Journal*, 26 (3), 338-352.
- Kuhn, T. S. (1970). *The structure of scientific revolutions*. Chicago: University of Chicago Press.
- Lowenfeld, V. (1958). *El niño y su arte*. Buenos Aires: Kapelusz.
- Lowenfeld, V., & Brittain, W. L. (1961). *Desarrollo de la capacidad creadora*. Buenos Aires, Argentina: Kapelusz.
- Ludwig, A. M. (1995). *The price of greatness*. New York: Guilford Press.
- Maslow, A. H. (1994). *La Personalidad Creadora*. Barcelona: Kairós.
- Matusek, P. (1977). *La creatividad. Desde una perspectiva psicodinámica*. Barcelona: Herder.
- McCrae, R. R. (1987). Creativity, divergent thinking, and openness to experience. *Journal of personality and social psychology*, 52 (6), 1258-1265.
- McCrae, R. R., & Costa Jr, P. T. (1999). A five-factor theory of personality. In *Handbook of personality: Theory and research* (Vol. 2, pp. 139-153).
- Mednick, S. A. (1962). The associative basis of the creative process. *Psychological Review*, 69 (3), 220-232.
- Merrifield, P. R., Guilford, J. P., Christensen, P., & Frick, J. W. (1962). The role of intellectual factors in problem solving. *Psychological Monographs: General and Applied*, 76 (10), 1-21.
- Miller, A. L. (2009). *Cognitive processes associated with creativity: Scale development and validation. Doctoral Thesis*. Ball State University.
- Mobley, M. I., Doares, L. M., & Mumford, M. D. (1992). Process analytic models of creative capacities: Evidence for the combination and reorganization process. *Creativity Research Journal*, 5 (2), 125-155.
- Mumford, M. D., Baughman, W. A., Supinski, E. P., & Maher, M. A. (1996). Process-based measures of creative problem-solving skills: II. Information encoding. *Creativity Research Journal*, 9 (1), 77-88.
- Mumford, M. D., Costanza, D. P., Threlfall, K. V., Baughman, W. A., & Reiter-Palmon, R. (1993). Personality variables and problem-construction activities: An exploratory investigation. *Creativity Research Journal*, 6 (4), 365-389.
- Mumford, M. D., Mobley, M. I., Uhlman, C. E., Doares, L. E., & Reiter-Palmon, R. (1991). Process



- analytic models of creative capacities. *Creativity Research Journal* , 4 (2), 91-122.
- Mumford, M. D., Supinski, E. P., Threlfall, K. V., & Baughman, W. A. (1996). Process-based measures of creative problem-solving skills III: Category selection. *Creativity Research Journal* , 9, 395-406.
- O'Quin, K., & Derks, P. (1999). Humor. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 845-853). San Diego, CA: Academic Press.
- Ochse, R. A. (1990). *Before the gates of excellence: The determinants of creative genius*. New York: Cambridge University Press.
- Okuda, S. M., Runco, M. A., & Berger, D. E. (1991). Creativity and the finding and solving of real-world problems. *Journal of Psychoeducational assessment* , 9 (1), 45-53.
- Olton, R. M. (1979). Experimental studies of incubation: Searching for the elusive. *The Journal of Creative Behavior* , 13 (1), 9-22.
- Otrera Y Gasset, J. (1964). *La rebelión de las masas*. Madrid: Espasa-Calpe.
- Piaget, J. (1973). *To understand is to invent: The future of education*. New York: Penguin.
- Policastro, E. (1999). Intuition. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 89-93). San Diego, CA.
- Riccio, D., Rabinowitz, V., & Axelrod, S. (1994). Memory: When less is more. *American Psychologist* , 49 (11), 917-26.
- Rodríguez Estrada, M. (1985). *Psicología de la creatividad: manual de seminarios vivenciales*. México: Trillas.
- Rodríguez Estrada, M. (2006). *Manual de creatividad: los procesos psíquicos y el desarrollo*. México: Trillas.
- Rogers, C. R. (1954). ETC: A review of general semantics. *Toward a theory of creativity* , 11 (4), 249-260.
- Rotenberg, A. (1999). Articulation. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 121-125). San Diego, CA: Academic Press.
- Runco, M. (1996). Personal Creativity: Definition and Developmental Issues. In M. A. Runco (Ed.), *Creativity from childhood through adulthood: The Developmental Issues* (pp. 3-30). San Francisco, CA: Jossey-Bass.
- Runco, M. A. (1996). Personal Creativity: Definition and Developmental Issues. In *Creativity from childhood through adulthood*. Jossey-Bass.
- Runco, M. A. (1997). Creativity research handbook . In M. A. Runco (Ed.). Cresskill, NJ: Hampton Press.
- Runco, M. A. (2014). *Creativity: Theories and themes: Research, development, and practice*. Elsevier.
- Runco, M. A., & Chand, I. (1995). Cognition and creativity. *Educational psychology review* , 7 (3), 243-267.
- Runco, M., & Dow, G. (1999). Problem finding. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 433-435). San Diego, CA: Academic Press.
- Russ, S. (1999). Emotion / Affect. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 659-668). San Diego, CA: Academic Press.
- Russ, S. W. (1993). *Personality assessment. Affect and creativity: The role of affect and play in the creative process*. Hillsdale, NJ: Erlabum.



- Salas, H. (2002). Una definición de la creatividad a través del estudio de 24 autores seleccionados (Tesis doctoral). Universidad Complutense de Madrid, Servicio de Publicaciones.
- Sapp, D. D. (1992). The point of creative frustration and the creative process: A new look at an old model. *The journal of creative behavior* , 26 (1), 21-28.
- Scott, T. (1999). knowledge. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 1, pp. 119-129). San Diego, CA: Academic Press.
- Simonton, D. K. (1998). Donald Campbell's model of the creative process: Creativity as blind variation and selective retention. *Journal of Creative Behaviour* , 32 (2), 153-158.
- Singer, J. (1999). Imagination. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 13-25). San Diego, CA: Academic Press.
- Smith, S., & Dodds, R. (1999). Incubation. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 39-43). San Diego, CA: Academic Press.
- Stein, M. I. (1953). Creativity and culture. *The journal of psychology* , 36 (2), 311-322.
- Sternberg, R. (2005). Creativity or creativities. *International Journal of Human-Computer Studies* , 63 (4-5), 370-382.
- Sternberg, R. J. (2006). The nature of creativity. *18* (1), 87-98.
- Sternberg, R. J., & Lubart, T. I. (1991). An investment theory of creativity and its development. *Human development* , 34 (1), 1-31.
- Sternberg, R. J., & Lubart, T. I. (1992). Buy low and sell high: An investment approach to creativity. *Current Directions in Psychological Science* , 1 (1), 1-5.
- Sternberg, R. J., & Lubart, T. I. (1993). Creative giftedness: A multivariate investment approach. *Gifted Child Quarterly* , 37 (1), 7-15.
- Sternberg, R., & Davidson, J. (1999). Insight. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 57-69). San Diego, CA: Academic Press.
- Stokes, P. (1999). Novelty. In M. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 297-303). San Diego, CA: Academic Press.
- Taylor, C. W. (1964). Some knowns, needs, and leads. *Creativity: Progress and Potential*.
- Thurston, B. J., & Runco, M. A. (1999). Flexibility. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (pp. 729-732). San Diego, CA: Encyclopedia of Creativity.
- Torrance, E. P. (1962). *Guiding Creative Talent*. Englewood Cliffs, NJ: Prentice-Hall.
- Torrance, E. P., & Shaughnessy, M. F. (1998). An interview with E. Paul Torrance: about creativity. *Educational Psychology Review* , 10 (4), 441-452.
- Tuska, C. D. (1957). *Inventors and inventions*. McGraw-Hill.
- Urban, K. K. (1995). Different models in describing, exploring, explaining and nurturing creativity in society. *European Journal of High Ability* , 6 (2), 143-159.
- Veron, P. E. (1970). *Creativity: Selected readings*. Middlesex: Penguin.
- Wallach, M. A., & Kogan, N. (1965). *Modes of thinking in young children*. New York: Holt, Rinehart, & Winston.
- Ward, T. B., Smith, S. M., & Vaid, J. E. (1997). *Creative thought: An investigation of conceptual structures and processes*. Washington, DV: American Psychological Association.



- Weisberg, R. W. (1993). *Creativity: Beyond the myth of genius*. WH Freeman.
- West, M., & Rickards, T. (1999). Innovation. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 45-55). San Diego, CA: Academic Press.
- Wilson, R. C., Guilford, J. P., & Christensen, P. R. (1954). A factor-analytic study of creative-thinking abilities. *Psychometrika*, 19 (4), 297-311.
- Wink, P. (1999). Self processes and creativity. In M. A. Runco, & S. R. Pritzker (Eds.), *Encyclopedia of creativity* (Vol. 2, pp. 537-541). San Diego, CA: Academic Press.
- Witt, L., & Beorkrem, M. (1989). Climate for creative productivity as a predictor of research usefulness and organizational effectiveness in an R&D organization. *Creativity Research Journal*, 2 (1-2), 30-40.
- Woodman, R. W., & Schoenfeldt, L. F. (1990). An interactionist model of creative behavior. *The Journal of Creative Behavior*, 24 (4), 279-291.